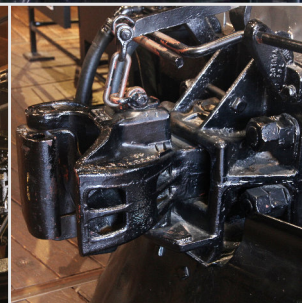
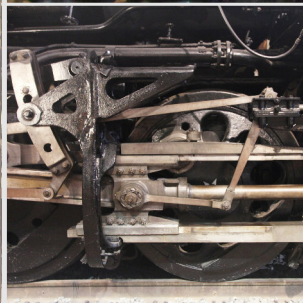


Southern Pacific #4294

CAB FORWARD LOCOMOTIVE

Preliminary Report



5/59
Southern Pacific Cab-Forward No. 4294

Preliminary Report

by

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California State Railroad Museum

Department of Parks and Recreation

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Southern Pacific Cab-Forward No. 4294

The Southern Pacific's locomotive No. 4294 has the distinction of being the last new steam engine purchased by SP, as well as the last of the unique cab-forward design.

Acquisition of this giant 4-8-8-2 Articulated Consolidation in 1944 and its demise as a workhorse over the Sierras a dozen years later marked a high point in the 100-year history of steam on the railroads of the West.

No. 4294 was one of 256 cab-front locomotives placed in service by SP between 1910 and 1944. Although they were identified mainly with the Sierras, these locomotives also saw service on the Tehachapi Mountains, the Shasta Division, the Modoc route and other parts of the SP system.

In 1908, SP ordered two huge Mallet engines from the Baldwin Locomotive Works of Philadelphia. Longer and more powerful engines were needed for the heavy traffic over the Sierra-Nevada Range. Delivered in 1909, these 2-8-8-2 Mallet-Consolidations were powerful enough, but the smoke, heat and gases they produced in the 39 tunnels and 37 miles of snowsheds were more than the crewmen could take, even with the use of respirators.

During 1909, what became a "celebrated" meeting was held in the office of Taylor W. Heintzelman, superintendent of motive power, to discuss the problems of the new equipment. At this Sacramento gathering, Charles Browning, Jr., engineer of tests, recalled seeing a North Pacific Coast narrow gauge locomotive (No. 21) with the cab in front of the boilers.

Browning was referring to the "Thomas-Stetson", a 4-4-0 locomotive built in 1900 by NPC at the Sausalito shops over the chassis of Locomotive 9, the "M. S. Latham". This locomotive was manufactured in 1875 by Baldwin. It had a disastrous career, the victim of two wrecks, one a tragic plunge into a swollen creek, killing seven men.

William J

Bill Thomas, NPC master mechanic at the shops, conceived the cab-forward concept in rebuilding, renumbering and renaming the locomotive. The idea was to provide better visibility for the engineers on NPC's hairpin curves. NPC President James Burgess Stetson concurred. The plan was unsuccessful in the long run, however, as No. 21 served just a few years before being scrapped in 1905. A low-water incident had caused boiler damage the railroad decided against repairing. Furthermore, the locomotive was unpopular with the crews who felt unprotected at the very front of the train.

SP management, nonetheless, was impressed with Browning's suggestion. Fifteen additional Mallets already were on order. SP instructed Baldwin to carry out the cab-forward concept, submitting some engineering data to support the scheme. Baldwin put its own technical staff at work and did the rest, delivering the first cab-forwards to the Sacramento shops in February and March of 1910.

Years later, Baldwin claimed credit for originating the cab-forward. However, western railroad historians generally give the honors to SP personnel, acknowledging, of course, the inspiration came from NPC's cab-forward, reputed to be the first U. S. locomotive to run cab first.

Needless to say, SP was the only major railroad to put such a locomotive into general use, and with considerable success. Books, articles and pamphlets have been written about cab-forwards, and almost always SP is praised for being unafraid to break with the past.

Crews at first were reluctant to handle the cab-forwards, expressing the same fears of being unprotected in event of a head-on collision. Experiments proved, however, that whatever danger this entailed was more than overcome by the safety from asphyxiation from the smoke and fumes breathed by crews when the smokestack was in front.

Successive SP orders for cab-forwards followed over more than three decades, ending with the 1944 purchase of nine mammoth AC-12's at a cost of \$256,000 apiece. These engines, of which No. 4294 was the last delivered, weighed one million pounds each, including fully loaded tender. 0- 20 ?

One of the early orders (1911) was for 12 compound passenger Mallets of the 2-6-6-2 type. These engines, for safety reasons, later were converted to the 4-6-6-2 wheel arrangement, following a derailment blamed on lack of wheel support at front.

In the early 1950's, many of the Articulated Consolidations still were in service, the Mallet Consolidations having long been scrapped. But the rapid delivery of diesel locomotives, not only for SP but for other major railroads, soon made the iron horse obsolete. The last freight run of a cab-forward was on November 29, 1956, when No. 4211 helped a couple of diesels pull a freight

train from Niles to Roseville. The next day, 4211 was placed in storage. The last passenger run was on November 30-December 1, 1957, when No. 4276 took an excursion train from the San Francisco Bay area to Sparks and return.

On September 24, 1958, SP wrote off all its 28 remaining AC's. Only nine of these were being carried as stored, serviceable.

No. 4294 has a history all its own. It handled passenger and freight traffic and at times was seen pulling the famous "Overland Limited" up to the 7,000 foot high summit at Norden.

After its retirement, the Pacific Coast Chapter of the Railway and Locomotive Historical Society organized a campaign to save No. 4294 from the scrap pile. SP responded by putting the engine on "hold" while other similar locomotives were scrapped.

The RH&HS campaign was climaxed at a civic celebration October 19, 1958, when No 4294 was dedicated to the City of Sacramento. The ceremony took place in front of the Sacramento SP Station, where No. 4294, along with the "C.P. Huntington" Locomotive No. 1, went on display.

In May, 1967, both locomotives were taken off display to make way for a freeway interchange on Interstate Highway 5.

Two years later (May, 1969), No. 4294, freshly painted, went on display again near the SP Station in commemoration of the 100th anniversary of the driving of the golden spike at Promontory, Utah, May 20, 1969.

For the last 10 years, No. 4294 has been stored in the Sacramento SP yards, awaiting restoration for its permanent display in the California State Railroad Museum.

No. 4294, unprotected from the elements in the last decade and stripped of many of its parts, particularly in the cab, is badly in need of paint and refurbishing before going on public display again.

Restoration Proposal: There are two suggestions: Restore the locomotive as it arrived from the factory or as it appeared during its later working years, say 1950 to 1956. In either case, many parts (fabricating when necessary and practical) must be replaced. A complete paint job, particularly in the cab, is in order.

Chronology of Cab-Forwards

1900	North Pacific Coast builds No. 21 at Sausalito shops, with cab in front.
1905	No. 21 scrapped, unpopular with crews.
1908	SP orders two giant 2-8-8-2 Mallet Consolidations (MC's) from Baldwin for heavy traffic over Sierras.
1909	Meeting in Heintzelman's office in Sacramento to discuss problems of new locomotives. Idea of cab-forward advanced--NPC's No. 21 cited.
1909	SP instructs Baldwin to build 15 Mallets, already on order, with cabs forward.
1910 (Feb.-Mar.)	First cab-forwards arrive in Sacramento.
1911	SP orders 2-6-6-2 Mallet-Moguls (MM's) for passenger service, cab forward.
1914	By now, SP had 39 miles of snowsheds in Sierras: "Longest House in the World".
1915	<i>Int'l</i> AC-3 (4043) refinished for display at Pan-Pacific Exposition in San Francisco. <i>ama</i>
1927	Mallets converted to simple articulateds.
1928	New type 4-8-8-4 AC cab-forward developed.
1928 (Oct.)	First AC-4's delivered from Baldwin.
1929 (Aug.-Sep.)	AC-5's delivered.
1930-31 (Jul.-Jan.)	AC-6's delivered.
1936	First cab-forwards to be scrapped: 4011, 4013, 4022.
1937 (Feb.-Sep.)	AC-7's delivered.
1939 (Aug.-Nov.)	AC-8's delivered.
1942	AC-10's delivered.
1942-43	AC-11's delivered.
1943-44	AC-12's delivered--cost \$256,000 each.
1949	Last of converted Mallets scrapped.

- 1956 (Nov. 29) Last freight revenue run of cab-forward. 4211 used as helper on string of refrigerators from Niles through Altamont Pass. *to Roseville*
- 1957 (Nov. 30-Dec. 1) Last passenger run of an AC, when 4276 took excursion train from Oakland to Sparks and return.
- 1958 (Sep. 24) SP wrote off 28 remaining AC's, only nine of which had been carried on roster as serviceable.
- 1958 (Oct. 19) No. 4294, saved from scrap, put on display in Sacramento.

Chronology of SP No. 4294

1943 Last ^{OK}20 cab-forwards, AC-12's, ordered from Baldwin.

1944 (Mar.) Last AC built, No. 4294, delivered to SP, officially added to roster March 19.

1940-50's No. 4294 used in both passenger and freight. Had assignment on Overland Limited.

1956 (Mar. 15) No. 4294 retired by SP. Railway and Locomotive Historical Society begins campaign to save No. 4294.

1956 (Apr.) SP puts No. 4294 on "hold".

1956 (Jun.) SP agrees to place No. 4294 on display in Sacramento next to C.P. Huntington.

1958 (Oct. 19) SP No. 4294 dedicated to City of Sacramento at "Salute to Steam Age" program at SP Depot.

1967 (May) No. 4294 moved from SP Depot to make way for construction of freeway interchange.

1969 (May) No. 4294 repainted on commemoration of centennial of driving of golden spike. Briefly on display, Sacramento.

1969-79 No. 4294 stored at SP Sacramento shops awaiting placement in California State Railroad Museum. On October 11, 1977, the City Council of Sacramento and the Sacramento Museum and History Commission present No. 4294 to California Department of Parks and Recreation on behalf of California State Railroad Museum, effective October 5, 1977.

Missing Parts -- SP 4294

The following are missing or broken:

- Air horn (a makeshift flared tube has been substituted).
- Running lights.
- Right train indicator glass cracked.
- Number missing from number plate (research required as there may have been no raised numbers due to war time austerity).
- "SP" marking not on front of cab.
- Auxiliary air tank drain valve (right side).
- Oil cup caps (flange oilers, lead truck).
- Unknown part, below auxiliary air tank (right side).
- Bent stanchion, handrail, right side immediately to rear of cab on top of boiler.
- Speed recorder cable.
- Nathan lubricators DV-7 (forward) and DV-4 (rear) both sides.

- Ladder and rail at rear of tender missing (but suitable replacement on hand).
- Globe for backup light.
- Builders, Superheater, and Trust plates.
- Stack light explosion-proof cover.
- Plug from air pump governor.
- Cap from left sand pipe rear center.
- Rear sand dome cover.
- Generator exhaust pipe.
- One valve in turret not connected, but all are in place.

Cab Interior

- Overhead junction boxes, all covers.
- Reverse lever quadrant.
- Train and engine brake handles.

- All lights for gauges on both engineer's and fireman's side.
- All tubes cut and missing for all gauges, brake controls, etc.
- Handles from sanding valves.
- Cab light.
- Fireman's draft lever.
- Defroster, respirator, and bell valves.
- Water cooler and brakeman's seat.
- Ratchets to hold forward windows open on outboard side only, both windows.
- Oil cans and sand scoop.
- Miscellaneous other unidentified pieces from cab interior.

Check of locomotive was made both from Ken Yeo's personal knowledge of the locomotive and by comparing it with photographs of it and other AC-12's in R. J. Church's book Cab-Forward. We need additional opinions and comments from crewmen or maintenance men who are familiar with the cab interior to identify items that are missing from areas for which we have no photographs.

Top of tender was not checked as there was no way of reaching it without an extension ladder. The sheet metal parts of the locomotive all show extensive corrosion.

All areas of the locomotive were photographed where parts appeared to be missing. These will be enlarged and used for future reference.

Sidelights of Cab-Forward Era

On April 6, 1944, the alertness of the crew of Locomotive No. 4293, heading down the grade toward Dutch Flat, saved the life of a 19-month old boy who was playing on the track.

The engineer could not stop the train in time, but was able to slow it down so that Brakeman Tug McDaniel and Fireman J. Ulrich were able to climb down to the track, outrun the locomotive and rescue the child.

A dispute raged in earlier years over whether SP or Baldwin Locomotive Works should have the primary credit for the development of the Cab-Forward.

Author Ralph D. Ranger, Jr., puts it this way: "I do not say that Baldwin did not help a good deal, but rather, that it did not come up with the original idea, only with subsequent design changes as the lineage of the cab-aheads progressed."

Another writer said: "In after years some of the Baldwin staff took credit for having fathered the back-up idea, but no true SP man ever let this claim pass without offering vehement disagreement."

No. 4043, a Mallet-Consolidation-6 (MC-6) was refinished in expensive enamel with raised polished letters and numerals for the Pan-Pacific Exposition in San Francisco in 1915.

On her "maiden voyage", No. 4208, an Articulated-Consolidation-1 (AC-1), went down an embankment near Auburn while pulling the Overland Limited. This led to a change in the wheel arrangement for these first cab-front passenger locomotives from 2-6-6-2, to 4-6-6-2. The accident occurred soon after the 4208 had been delivered in November, 1911.

In the days of steam, boiler explosions on locomotives were an industrial hazard but occurred rarely. The cab-forwards were not exempt. One of the worst tragedies involving a cab-forward occurred May 3, 1941, when No. 4199, an AC-8 just two years out of the factory, exploded at Cooper, California, while traveling at 40 miles an hour on the coast division, killing four crew members. The explosion was due to low water level.

When SP tested its first Mallet engines, veteran Engineer W. H. Kopka was at the throttle. His comment: "I thought all hell had broken loose. Noise, smoke, heat and more noise. Why, you can hardly live in that cab going through a tunnel or a long shed." The tests led to the change in the design to cab-ahead in orders for giant locomotives for the Sierras from then on.

The general public called all the big locomotives going over the Sierra, "Mallets". (The Mallet type of locomotive, invented by a Frenchman, Anatole Mallet, was introduced in the U. S. in 1904.) But all the power used on the western grades was not by the Mallet. The Mallets were articulated compound

engines. They offered power but not speed. SP finally rebuilt many of these mallets to reflect the absence of compounding and the name Mallet was dropped from the description. They were then called Articulated Moguls (AM's) or Articulated Consolidations (AC's).

Even the prestigious Railway and Locomotive Historical Society refused to surrender the term "Mallet", calling many cab-forwards mallets, with lower case m, after they had been converted to AC's.

SP was so desperate for motive power during World War II, they assigned some cab-forwards to the tracks of Pacific Electric, its subsidiary in Southern California. They thundered through city streets, cracking plaster and breaking dishes in homes. SP was petitioned by some residents to "remove the plague from our doorsteps."

March 1956

Appeal to Save the "Last Mallet"

The Pacific Coast Chapter has headed a drive to have S.P. Mallet No. 4294, the last mallet purchased by the S.P. in 1944, which is now running out its miles, saved as an historic relic. It seems only proper that this type of engine, unique on the S.P., should be represented in the same manner as the "C.P. Huntington".

April 1956

Partial "Success" in Mallet 4294 Drive

A temporary success can be reported in the drive to save Southern Pacific Mallet No. 4294 in that a "hold" has been placed on this engine to prevent the intended scrapping.

June 1956

Southern Pacific to Preserve Engine 4294

The many letters from members and others sent to President Russell of the Southern Pacific has resulted in a decision by the S.P. to place their last-purchased steam engine No. 4294 on display at Sacramento next to the "C.P. Huntington". The official dedication is expected this fall and may be the high point of a gala rail fan event.

February 1958

Maritime and Railroad Museum

Meanwhile, at Sacramento, S.P. officials have been attending a number of meetings with city officials in regard to putting the giant mallet No. 4294 on display. The engine will probably be put next to the "C.P. Huntington" in from [sic] of the station. It takes a lot of planning to move a locomotive the size of No. 4294. A day of civic celebration will be held on the dedication day, scheduled in late spring or early summer.

September 1958

Saturday and Sunday, October 18-19

A Sacramento farewell to steam observance will take place with planned dedication of mallet No. 4294 at Sacramento Depot.

October 1958

Steam Coming to a Close

At Sacramento on Sunday, October 19, returning from Reno, a "Farewell to Steam" dedication ceremony will take place in front of the S.P. station by the C.P. Huntington and the newly installed No. 4294. Public officials, including Governor Goodwin Knight and the Mayor of Sacramento, will participate along with officials of our society (R&LHS, PCC)...Also taking part will be the fifty-piece S.P. band.

November 1958

Farewell to Steam Great Success

At Sacramento we "Saluted the Era of Steam" by dedicating No. 4294 to its new resting place before the S.P. station...

Annual Report 1958

The gala program at Sacramento dedicating the cab-in-front locomotive in front of the station was well received and will be long remembered.

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PAINT SPECIFICATIONS FOR SP DIESEL 6051,
SP STEAM LOCOMOTIVE 449 AND GN RPO 42

Numerous questions have been raised about the selection of colors for the above engines. Looking back 10 years this is my account of color selection.

In late 1979 and early 1980s we were researching the 6051 for its restoration by the California State Railroad Museum. The researcher handling the project had not yet received the drawings from EMD giving their description of paint specifications and we were attempting to determine them locally.

At the same time we were researching 6051, we were also researching color specifications for the GN RPO 42, specifically, Postal Car Green. We could find no records of this color from either the Postal Service or from the railroad companies since with the demise of the Railway Mail Service records had been destroyed.

As shops were being closed in the Southern Pacific Sacramento Yards we were allowed to go thru the records being thrown out. By good fortune, we found a requisition submitted by an unknown painter in 1967 for 15 gallons of Postal Car Green and with a stock number for the paint. We took the requisition to SPs materials section and they in turn sent us to the yard chemist. The chemist advised us the Market Street offices had sent him all of their old paint chips for saving or disposal as he saw fit. Fortunately he had chosen to save them. These chips or samples are called "Drift panels" and are paint samples, 5-3/4" x 3-7/8" in size and shielded from fading by a protective black envelope. The reverse side of the panel carries the SP name, the Sunset logo, the title "Color Drift Control" and name and number of the sample (Example: "Panel No. 154 Postal Car Green"), the date, a warning that the sample should be kept in the black envelope when not being used and the notation "Bowles and Color Drift Control System, Bowles Printing Corporation, 75 Third St., San Francisco, California 94103."

While checking Postal Car Green we asked the chemist if he had Drift Control Panels for the SP "Daylight" orange and red. There was but one each of these colors. He asked to retain them but permitted us to use them.

When the actual painting of SP 4449 and 6051 was to begin an interesting event took place. It was my understanding the PCC R&LHS was to assist with funds to buy paint but actual purchase would be done by SP as they could buy the paint at a much lower price. By this time we had the paint specifications from the EMD drawings but paint was in the older DuPont Duco while the new paint was to be Dupont Imron. The paint was ordered by SP but a call came back from Dupont that the exact shade of orange listed for the older Duco was no longer being made in Imron. Ken Yeo, head of our restoration shop, a Southern Pacific representative and I reviewed the color chips of the newer Imron paints. Two colors neatly bracketed the original orange Duco color drift control sample. We selected the lighter shade as being closest to the original Dupont Duco Daylight orange.

When 4449 arrived for the Railfair event at the opening of the Museum we immediately put the orange drift panel against the orange color on the locomotive. As far as our eyes could tell it was a perfect match. The same colors were later applied to our SP 6051.



R.H. Denison

Former head of -
Restoration Research Team

